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ABSTRACT

Advances in educational technology have brought about changes in the scope of learning facilitated by technology, the roles of teachers and learners, and the sophistication of the processes used in developing instruction which will be communicated by technology. This paper considers these issues from the viewpoint of the learner. The first section describes the importance of technology in meeting the growing educational needs of society. The second section addresses the impact of technology in determining where and when learning can occur, and provides guidelines for systems of instruction that bridge gaps of time and space. The third section presents a model of the teaching and learning process that accommodates physical distance and discusses the implications of the model for the role of the teacher. In the fourth section, the implications of new educational technologies for the learner are presented, together with a three-stage model of the learning process (acquisition of information, transmutation of information, and evaluation/application of information). It is argued that the classroom model emphasized the first stage of learning, with the teacher as information and law-giver, assuming extrinsically-motivated passive learners. It is further argued that the new model made possible through technology will not work unless the teacher is seen as the developer of learners, preserving their integrity and their responsibility for self-direction. It assumes active learners who are intrinsically motivated and an equal emphasis on all three stages of learning. (21 references) (GL)

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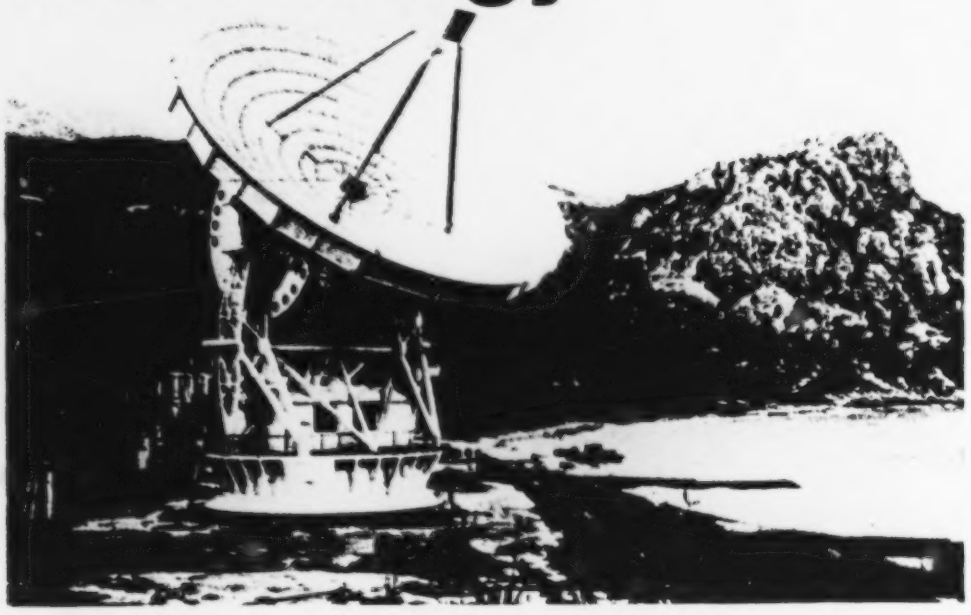
ZFF PAPIERE 26

Charles A. Wedemeyer

Learning Through Technology



Zentrales Institut für Fernstudienforschung
Hagen, Dezember 1978

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Kurze Zusammenfassung

Auf den ersten Blick ist dieser Aufsatz von ***Wedemeyer in seinen Grundthesen nichts Aufregendes,*** *nichts Neues. Seit 10 Jahren werden diese Thesen diskutiert, seit Jahrzehnten finden technologische Entwicklungen statt, die Lernprozesse völlig verändert haben. Der Vor-Abdruck seines Referates soll ein weiteres Mal dokumentieren, was In-sidern längst geläufig ist, aber noch nicht von allen Betroffenen wahrgenommen wurde: Die moderne Hochschule funktioniert im Grunde doch noch so wie im Mittelalter - sie setzt die Kriterien, sie bestimmt die Curricula, sie betrachtet in ihrer Machtvollkommenheit die Lerner als Bittsteller und gewährt den Segen der wissenschaftlichen Qualifikationsbescheinigung - oder auch nicht.*

Wedemeyers neue"Richtlinien für Unterrichtssysteme" sind

1 Ein Unterrichtssystem sollte in der Lage sein, überall - auch für nur einen einzigen Lerner, unabhängig vom Vorhandensein einer Lehrperson - zu funktionieren.

2 Das Unterrichtssystem sollte dem Lernenden größere Verantwortung für seinen Lernprozeß einräumen.

3 Das Unterrichtssystem sollte die Lehrenden von Verwaltungs- und Aufsichtsaufgaben entlasten, damit sie sich mehr um erzieherische Aufgaben kümmern können.

4 Das Unterrichtssystem sollte Lernwilligen (Schülern und Erwachsenen) ein breiteres Angebot an Kursen und Methoden machen.

5 Das Unterrichtssystem sollte alle geeigneten Unterrichtsmedien nutzen können.

6 Das Unterrichtssystem sollte Medien und Methoden verbinden und mischen können, so daß Lehre auf je optimale Weise ermöglicht wird.

7 Mediennutzung und technologische Anwendungen sollten transparent gemacht werden, um ihren Einsatz und die Unterrichtsstruktur selbst zu befruchten.

8 Das Unterrichtssystem sollte Anpassung ermöglichen an individuelle Lernerunterschiede.

9 Das Unterrichtssystem sollte Lerner-Leistungen auf einfache Art evaluieren und nicht durch Restriktionen in Bezug auf Ort, Geschwindigkeit, Methoden und Abfolge sanktionieren.

10 Das Unterrichtssystem sollte es jedem Lerner ermöglichen, anzufangen, zu unterbrechen oder aufzuhören, wann immer er will.

Lediglich die erste der genannten Richtlinien würde eine radikale Änderung der gegenwärtigen Unterrichtssysteme bedeuten: Distanz zwischen Lehrenden und Lernenden ist aber nicht nur physische Distanz, sondern auch soziale Distanz, kulturelle Distanz und psychische Distanz.
Eine Veränderung der physischen Distanz müßte keineswegs die anderen Distanzen mitverändern - Im Gegenteil: Wenn Unterricht als Interaktion der beteiligten Elemente (Schüler, Lehrer, Inhalt, Methode) begriffen wird, dann sind Methoden/Medien, ob sie mehr oder weniger "distant" wirken, für das Unterrichtsmodell selbst unerheblich. Wichtiger als die Feststellung, daß die Distanz keine wesentliche Rolle spielt bei solch einem Unterrichtsmodell, ist die Frage, ob Lehrer und Schüler bereit sind, gelernte Rollenmuster, die sich auf nur eine Erscheinungsform von Unterricht beziehen - den Klassenzimmer-Unterricht - aufzugeben und zu verändern.
Eine solche Änderung der Rollenmuster, der Erwartungshaltung an ein Lehrsystem, ist aber im Falle des Fern-Unterrichts von vitaler Bedeutung. Technologie determiniert nicht per se den Grad von Lerner-Autonomie, und letztlich geht es um dieses Ziel - um selbstverantwortliches, autonomes Lernen.

Zusammengefaßt erkennt Wedemeyer sieben Problembereiche, die einer wirklich sinnvollen Nutzung von Unterrichtstechnologie noch im Wege stehen:

1 Unterrichtstechnologie wird weiterhin zur Unterstützung eines konventionellen Unterrichtsmodells eingesetzt.

2 Bei der Entwicklung von Software orientiert man sich noch weithin an konventionellen Inhalten.

3 Lernen wird weiterhin noch als Ergebnis von Beschulung verstanden (und damit wird übersehen, daß das meiste außerhalb von Schulen gelernt wird).

4 Schwergewicht wird weithin auf Apparateentwicklung gelegt; es gibt fast excessive Bemühungen, um das "Wie" von Unterricht, anstatt um das "Was" und "Warum".

5 Es gibt noch kein Rezept gegen das Problem der Rollenverunsicherung der Lehrenden angesichts der Unterrichtstechnologie.

6 Traditionellerweise überwiegt in unseren Gesellschaften eine Versorgungsmentalität, die die Menschen immer abhängiger macht, anstatt den Menschen zu mehr Selbstverantwortung und Autonomie zu verhelfen.

7 Unterrichtsplaner haben Angst vor der physischen Distanz zwischen Lehrer und Lerner und haben versäumt, Vorteile dieser Distanz auszunutzen.

C Fernuniversität - Gesamthochschule

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LEARNING THROUGH TECHNOLOGY;
Considerations from the Point of View of the Learner [1]

by

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For most learners, learning through technology is not a new experience. Clay tablets, papyrus, paper-pen-and ink, the hornbook, chalkboards, books, pictures, newspapers and magazines, the postal service, films and records have been in use for generations. Most learners are familiar with these early technologies used to improve learning. Fewer have had direct experience with radio, television, electronic sound and visuals on tape, the telephone, computer and the communications satellite, although these, too, have had wide use in learning in today's world.

What is different about learning through technology today is the scope of learnings facilitated by technology, the altered roles of teachers and learners, the changed environment for learning necessitated by technology, and the sophistication of the processes used in developing instruction which will be communicated by technology.

This chapter will touch on these points and others, but from the viewpoint of the learner in his relationship to the various human and non-human aspects of learning through technology.

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[1] Reprinted by permission. From the chapter "Learning through Technology - From the Point of View of the Learner", in Educational Applications of Communication Satellites, edited by Lawrence P. Grayson, to be published by IEEE Press (The Institute of Electrical and Electronics Engineers, Inc.) New York, 1979.

Technology and the Changing Importance of Education

In pre-industrial America most workers were engaged in farming and handicrafts.[1] Until the 20th Century whether a person was literate, the product of regular schooling, or "self made" was of little practical importance. But as Veblen[2] pointed out in 1914, the educational emphasis of the machine age fell "rather more decidedly on general intelligence and information," as America was being transformed from a predominently rural to a predominently urban society. The acceptance of, and commitment to, technology as a means of social, economic and technical growth brought great and unforeseen changes to American life, and among other effects, greatly increased the importance of education to the individual and society.[3] By the 1950's it had become clear that the education an individual obtained was of the greatest practical importance in determining his social and economic place in society, and furthermore, that technological change was introducing new hazards even to those who had obtained secondary or collegiate education. The knowledge explosion which had fueled technological development made it increasingly necessary that people continue learning to avoid job-knowledge obsolescence.

Now, in the late 1970's, there is a growing sense of urgency respecting learning. In North America and Europe, and spreading into other continents, there is growing conviction that everyone has a need for, and a right to, learn throughout life. The idea of "schooling," which is culturally linked to the discrete place-time education of children and youth, is being replaced by the concept of "lifelong learning" unhampered by place-time barriers, motivated by the changing and maturing needs of

learners, and undertaken by responsible and self-directing adults. Technology, which was to a large extent responsible for the social and economic conditions which make life-long learning imperative, is now being looked to for the means by which opportunity and access to learning can be provided life-long, and instruction can be developed to meet the changing needs of learners in a school, at home, or on the job.

On a global scale, the multiple, inter-related problems of modern society (health, energy, pollution, peaceful co-existence—to mention only four) seem likely to be resolved only if people are able during their lives to learn new attitudes, values and behaviors. Technological change has sharpened and intensified both the individual and the social purposes which motivate learning. At the same time it is increasingly recognized that man's capacity to learn has been the least appreciated and least developed human resource. We seem to be on the threshold of a "learning society" in which learning is regarded as essential not only for the very survival of man, but also as the only route to social and individual maturation. Technology will increasingly be an ally in achieving the learning goals of individuals and groups in the future.

Technology in Education and the Space/Time Concept of Instruction

While the need for technology in education seems self evident to many, the education professions in general have been reluctant to employ technology except in limited ways, constrained by the cultural, professional, psychological and economic givens of the teaching occupations.

Teaching and learning, the two basic and essential activities of educational systems, are usually thought of as connected real time activities, inseparable in space as well as time. The conventional concepts of teaching and learning (derived primarily from the Greeks and little changed in hundreds of years) must now come under careful scrutiny. Instruction was first face-to-face. It had to be. To communicate in those early days, one had to be within earshot. The teacher talked to the learner. For learning to occur, the learner and the teacher had to be chained in a space-time relationship: they had to occupy the same space at the same time.

The Platonic model (learners at the feet of the master, interacting voicebox-to-voicebox, earpan-to-earpan, eyeball-to-eyeball) has provided the conventional continuous loop communication for nearly all institutional education. The limitations on communications in Plato's time have thus placed an extraordinary and out-moded constraint still dominant throughout the world upon educational systems.

The invention of writing was perceived by Plato as a threat to proper learning. In like wise, educators since Plato have looked with a mixture of fear, disdain and suspicion at communications improvements which have revolutionized most of human activity, but have left institutionalized education relatively unchanged. The invention of printing, efficient postal services, photography, the telephone, voice recording, radio, television, the computer, laser beams, hallography, and the telecommunications satellite have had a significance for education that has been largely unperceived and unrealized.

The invention of writing broke the space-time barriers—persons who could read could now learn from a teacher who was in another place, even one who lived at another time. But writing and reading were skills enjoyed by only a small elite; and schools were still characterized by teaching-hyphen-learning: the two acts still chained in space and time.

The invention of printing spread books—and learning—throughout the literate world. Tutors at the medieval University of Oxford had in their libraries books from the Sorbonne, from Amsterdam, from scholars and teachers wherever they lived, and from other times. But the tutors still taught their learners on a chained space-time relationship.

The invention and spread of modern postal services linked scholars together throughout the world for learning from each other in two-way communication. But scholar-teachers still taught their students on the chained space-time relationship. The early universities had their origins in church-related activities—the training of priests, for example. The young cleric was expected to withdraw from society, to abandon the reality of everyday life, to submit himself to the regimentation of the institution. As education was extended to wealthy, privileged, and powerful lay persons who were to be gentlemen, to state officials, managers, military, and professional people, the stress on the learner's removal from regular life for education continued. The university continued as a cloistered retreat.

The modern university has retained some vestiges of this medievalism, operating primarily at <u>its</u> convenience—setting requirements and schedules for the learner. Similarly, in qualifying for certification in many professions, the applicant is still really a supplicant in that the

criteria by which he is judged are not simply his ability, knowledge, and skill, but in addition a medieval-like mystique of having passed successfully through a particular regimen related ideationally to the "laying on of hands."

Our conventional teaching and learning, therefore, make use of concepts of learning and teaching that have preserved the old mystiques; that have maintained space-time barriers to learning. The invention of modern means of communication based on electronics (tapes, discs, telephone, radio, television, the computer) has shattered the rationale for the chained space-time teaching and learning; yet the practice still persists as though there are no alternatives today, just as there were not a thousand years ago. It is indeed true that teachers tend to teach as they were taught, and learners tend to learn as they are told.

The personal, eyeball-to-eyeball instruction of Plato and Socrates was a necessity; there was no alternative. We have long admired and tried to cling to the values of the great Greek teachers—adaptation to individual, high learner participation, direct sense involvement, the role of teacher as thinker and mentor, and direct evaluation of progress or achievement. I suspect, however, that what we have chiefly clung to is <u>form</u>, i.e., keeping teacher and learner together in the same place and time, and <u>mystique</u>—the mystical values of the particular discipline or order. The space concept, of course, expanded: from one person to a small group, to large lecture sections. The mystique has generally rooted us firmly to the time-space relationship. However, in much of conventional education, we don't adapt well to individuals (except as we approach the Greek and medieval situation

of small seminar or person-to-person graduate teaching); we provide low level participation; we do not often involve the learner in the use of direct sense impressions; the teacher is often not the thinker or mentor but an impersonal conveyor-belt of information; and we don't evaluate directly for achievement, but indirectly through an elaborate schema of credits, grades, prerequisites, prescriptions, and prohibitions.

Yet few would disagree that the rationale for teaching and learning in the latter part of the twentieth century must derive from the needs of society now: the need to educate nearly all our citizens beyond the high school level; the recognition that no education is any longer terminal, that for substantial numbers education must be continuous throughout life; the rapidity of change that is one of the fruits of the knowledge explosion; the growth in population and in the mobility of the population; the need to bring all of our citizens to a useful role in society—these are only the more obvious factors that signal to us that we are living, teaching, and learning in a different society, in a different context, from that in which many of us began our careers, and even in which many of our learners began theirs.

Because the needs and contexts for learning have changed so radically, new guidelines are needed to provide instruction to learners.

New Guidelines for Systems of Instruction

1. The system should be capable of operation any place where there are students—or even only one student—whether or not there are teachers at the same place at the same time.

2. The system should place greater responsibility for learning on the student.

3. The system should free faculty members from custodial type duties so that more time can be given to truly educational tasks.

4. The system should offer students and adults wider choices (more opportunities) in courses, formats, methodologies.

5. The system should use, as appropriate, all the teaching media and methods that have been proved effective.

6. The system should mix and combine media and methods so that each subject or unit within a subject is taught in the best way known.

7. The media and technology employed should be "articulated" in design and use; that is, the different media or technologies should be reinforcing to each other and to the structure itself.

8. The system should preserve and enhance opportunities for adaptation to individual differences.

9. The system should evaluate student achievement simply, not by raising barriers concerned with the place the student studies, the rate at which he studies, the method by which he studies, or the sequence within which he studies.

10. The system should permit students to start, stop, and learn at their own paces.

Only the first of these requirements (a system that will operate any place, any time, even for one student) is radical in the sense it is incompatible with conventional teaching. All of the others could be introduced within the present framework of teaching. Number 1 can be accomplished

by use of technology; the others by a combination of technology and modernized concepts of learner-oriented, individualized teaching and learning.

The guidelines above, proposed nearly ten years ago,[4] go beyond the recommendation of media and technology for the improvement of regular instruction. Instead, the guidelines link the use of technology (primarily the technology of communications) to the provision of instruction within the contexts of present day society to meet the needs of present day learners.

The use of telecommunications in education is capable of providing new dimensions in the improvement of educational opportunity. Teachers and learners need no longer be brought physically together voicebox-to-voicebox, earpan-to-earpan, eyeball-to-eyeball, because telecommunications can provide this relationship as effectively and more economically (in large systems). Telecommunications can thus be employed in the improvement of the learner as an independent and responsible agent, in freeing him from external constraints which severely limit participating, in linking learning again (as it was in Plato's time) to the goal of individual fulfillment, to broader social and economic mobility and to social betterment.

Institutional education, which has tended to have the characteristics of a closed system, limited to a particular time and place because of its communications mode, can now be more open, ecumenical, transcultural—as the contexts of our diverse society and the needs of learners require.

What Model for Teaching and Learning?

Plato, disciple of Socrates and teacher of Aristotle, gave such powerful and compelling form to his discourses that for hundreds of years educators have clung to a concept of teaching-learning as a real time-space, continuous and interactive, communications loop. It is now recognized that teaching and learning are separate acts vested in different persons, and that both activities need not be constrained to real time-place conditions. Teaching and learning can safely and effectively be carried on with no loss of interaction, through the efficiencies of telecommunications, even though teacher and learner are separated in space and time.

The teaching-learning classroom model that has dominated traditional education has caused new models to be ignored or resisted, despite the failure of traditional education to fit the contexts and needs of present times. Because education and schooling have seemed synonymous in our society, few have thought of asking why we have schools; how they got to be as they are; and whether the classroom model—a cultural given—now meets the needs of society and all its learners.

The classroom model arose originally out of the context and needs of earlier societies:

- there were few teachers of any degree of qualification, and learners had to be gathered where teachers were to use the only communications mode available—speech.
- as many as possible of the available adults and older youths had to be used to carry on the labor-intensive work necessary for survival of the group; they could not be spared for teaching and child watching.

- child watching and the safety of children could be accomplished in schools while teaching was going on.
- there was an acute shortage of books and other resources useful in teaching and learning.
- it was more economical to carry on teaching in groups.

By putting learners together in classrooms with teachers and resources, the shortages could be minimized, the work force could be deployed as needed, more children would (hopefully) have the opportunity to learn, costs would be minimized, and children could be kept safe while parents and older siblings tended to the intensive work of home, farm, shop and community.[5]

Of the five reasons from the social and cultural context of earlier times for the creation and continuation of the classroom model, only one has any current validity: the need for child watching and safety. Despite the irrelevancy of most of the early reasons for creating classrooms, classroom instruction is still a major cultural artifact so pervasive that, as new societal contexts, needs and technologies for teaching and learning come into being, their value and relevance to education are principally assessed according to how <u>they can be accommodated to classroom schooling</u>, and they are not perceived as signals for the creation of new models for general, public and adult education.

In any teaching-learning situation it is generally agreed (Figure A) that there are four essential elements:

1. A Teacher
2. A Learner
3. A Communications System or Mode
4. Something to be Taught/Learned

Fig. A. Essential Elements in a Teaching-Learning Situation

Now, if the communications system is a given, either because it is the only system available (think of Plato meeting learners in the Grove of Akademos) or is a cultural artifact acting as an imperative, then there are no options, and the communication must be face-to-face, eyeball-to-eyeball, earpan-to-earpan speech. Then, if for the five reasons given earlier a box is put around the four essential elements, we have (Figure B) a classroom:

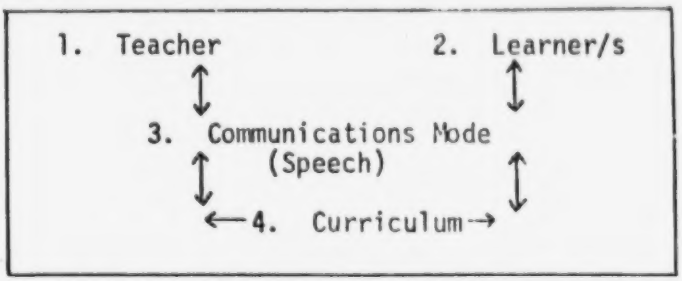

Fig. B. A Real Time-Space Teaching-Learning Situation: The Classroom

Each of the elements in the box is of course a subsystem of the total classroom system or model. Each subsystem is composed of all the elements/activities which make it up, and each of these is also a subsystem. A highly complex model thus evolves from the interactions of the four elements; a core of specialists evolves a profession to oversee the operation of the system and to preserve its integrity. What was begun as a fortuitous and intelligent putting together of the elements necessary to achieve

teaching and learning in specific societal contexts became a general model which is imposed on succeeding periods even though, as we have seen, the basic societal contexts and needs change and new options are available which, if we were to start from scratch as Plato did, would produce different models.

Thinking back, now, to the 10 requirements of education discussed earlier, you may recall that only one of the requirements was radical (a system that will operate any place, any time, even for only one student), and that the others were achievable within the present framework or model by using new technologies and modern concepts of learner and learning-oriented instruction.

A teaching-learning system that must work any place, any time, for one learner or many directly confronts the space-time-elite barriers of the classroom model. In fact, however, physical distance between teacher and learner has long been a problem in the classroom model. As classes became larger, and lectures replaced the dialogue that Plato conducted, the integrity of the model was breached. In many respects, only the illusion of being effectively face-to-face remains, as distance within the box lengthens between teacher and learners, and speech is amplified for ever more distant reception. Furthermore, "distance" is more than physical distance. There is social distance, cultural distance, and what has been called "psychic" distance for want of a better term. All of these are present wherever teaching and learning are carried on. Indeed, it seems that much of the fear or threat felt by classroom practitioners by the prospect of opening distance between teacher and learners has little to do with physical distance. Fear

and threat are more likely the product of an intuitive perception by teachers of the presence and importance of social, cultural and psychic distance in the classroom. This intuition, subconscious and unrecognized, also probably underlies the persistent assumption that learning is an event dependent upon social interaction. That this assumption is a delusion, as pointed out by Gagne,[6] does not prevent its being used to reinforce the classroom model, which seems to and indeed consciously attempts to confine learning to a social interaction space.

Of all the distance factors inherent in the classroom (social, cultural, psychic and physical) only the physical distance factor is immaterial so far as learning is concerned; physical distance between teacher and learner is irrelevant to learning. Yet the practitioners of the model fear any relaxation of the confinement of teaching and learning to the box because they may confuse physical distance with the other kinds of distance inherent in any teaching-learning arrangement.

Let us turn back to the classroom model to see what changes are needed to accommodate that one radically different element in the teaching-learning situation that permits operation of the system any time, any place, for one or many learners. Suppose we model the same four essentials of the teaching-learning situation this way (Figure C):

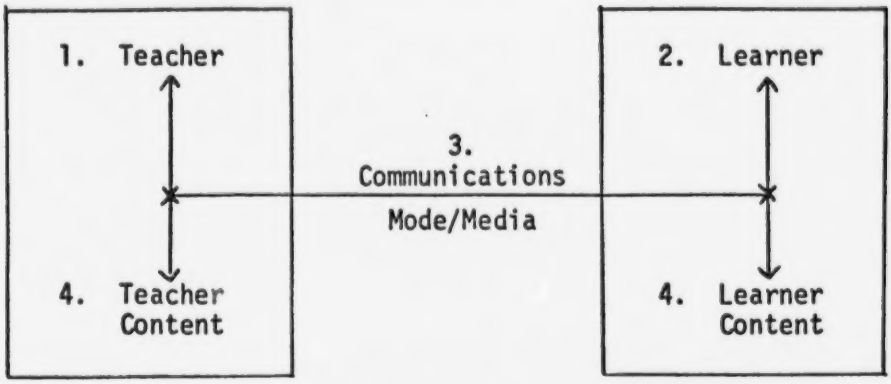

Fig. C. A Teaching-Learning Situation to Accommodate Physical Distance

Note that the four essential elements of any teaching-learning situation are still present. Is this a new model? Yes, if the classroom model is identified solely by its single, unique characteristic—the confining of all the essential elements into a box defining the social space necessary for communications by speech. No, if a teaching and learning situation or system is defined according to the interaction of the four essential elements for teaching and learning. Figure C is in fact a more accurate representation of the actual workings of the old classroom model; it is a model for any teaching-learning situation, whether learning takes place in or outside the classroom.

What was earlier called a radical conceptual change (the any time, any place, single or multiple learners requirement) may now be seen for what it really is: a natural and logical consequence of the interactions of the four essential teaching-learning elements, for any learners, consistent with what we now know about learning as an idiosyncratic activity, the contexts of our times, and the purposes and capabilities of educational communications.

Instead of a communications mode (speech) determining social space for learning (as in the classroom model) we have a model which leaves communications mode and learning space to the learner to select according to his situation and the options available to him. The availability of options implies institutional/teacher cooperation with the model in Figure C, something which has often been difficult to obtain because the model seems different from the cultural given, and hence threatens teacher self-concept.

Perhaps an important reason for the hostile or negative reactions of teachers to technology in education has been their lack of involvement in design and decision-making regarding technology in teaching. Uninvolved, they lack the opportunity to visualize themselves actively and successfully carrying out their teacher purposes and activities in any mode except that in which they were trained—the classroom. It is perhaps unreasonable to expect any professional to endorse change which appears to violate the concept of self built up through long years of training, preparation and experience. People do change self-concept to accommodate to growth, maturation and altered conditions, but such change has to be sought and learned. This kind of self change represents growth in the professional self, from a conviction that the purposes and activities of the profession can be carried out as well or better in the new mode as in the old. Teaching within a new, even though better, teaching-learning model requires such an accommodation if it is to be done without threat, fear, hostility or negative anxiety.

Learning through Technology

If teachers in a new mode must learn, adapt, accommodate, and mature in professional self-concept, what about learners? The learner who knows

only one way of learning, who has been conditioned to be dependent upon a teacher for learning goals, activities, resources and knowledge-of-results also needs to learn, adapt, accommodate and mature in the processes of learning. This is not as serious a problem for learners, however, as for teachers learning different ways of teaching. Learners have not committed themselves to a professional model; they tend to be younger; they directly experience the reinforcement of the learning they experience; and they are familiar with, and have confidence in technology.

Some older learners, adults who have been away from school for a long period of time, approach new learning formats with lack of confidence because their earlier schooling stressed a dependency which they do not know how to give up. Other adults, who have discovered the satisfactions of greater independence in their lives, find new modes of learning through technology attractive and rewarding immediately. Tough's work with adults[7] indicates how successfully many adults pursue learning projects independently, selecting goals, activities, resources and evaluating results by themselves.

"Learning through technology" is not merely a matter of substituting technology for the classroom. As Moore pointed out[8] learning apart (physically separated) from a teacher through communications by print, mechanical or electronic devices, implies a quite different concept of learning itself from that acquired in schools. The person who learns through technology is not only physically distant from the teacher, using print, mechanical or electronic media for communicating, he is also as a learner required to be more autonomous. The learner dependency sets believed and practiced by teachers, and required of learners in schools, come apart when teacher and learner are physically distant from each other.

Learning through technology puts the teacher and learner in a different relationship, as indicated in Figure C. Teachers who design instruction for distant learners from a classroom view of learning often fail; learners who enrol in distant courses from an expectation of classroom type learning often drop out. The factor of learner autonomy or independence is important to both teacher and learner in the new patterns of learning via technology.

The distinction between dependence and independence in learning is, however, not bipolar (between two extremes), but is best expressed on a scale or range. Moore[9] identifies eight degrees in the range from autonomous to non-autonomous learning. He asks three questions in categorizing a learning program:

1. Is the selection of learning objectives made by the learner, or the teacher?
2. Is the selection of learning resources (people, books, media) sequence and pace made by the teacher or the learner?
3. Are the method and criteria of evaluation decided by the teacher or the learner?

Technology, per se, is not a determiner of learner autonomy. Technology, however, opens the doors to greater learner independence by permitting physical distance between teacher and learner. Learners not under the constant control and direction of teachers, in a different learning environment from the classroom, begin to exercise greater autonomy as a natural and maturing condition. Knowles[10] has pointed out that growth towards learning

independence is "in tune with our natural processes of psychological development." All living things grow towards independence in order to survive. The basic purpose of schooling, as stated in numerous curriculum documents and commencement addresses, is the preparation of the learner for that time when school won't be there to teach him, and he'll have to proceed on his own. Unfortunately, school/teacher directed learning results in the conclusion that "most of us only know how to be taught; we haven't learned how to learn."[11]

Consequently the new programs employing technology between separated teachers and learners may frustrate the teachers and the learners. Knowles cautions that "Students entering into these programs without having learned the skills of self-directed inquiry will experience anxiety, frustration, and often failure, and so will their teachers."[12] Yet the separation of teacher and learner, and the opening door to independence in learning are fortuitous, for "people who take the initiative in learning (proactive learners) learn more things, and learn better than do people who sit at the feet of teachers waiting patiently to be taught (reactive learners). They enter into learning more purposefully and with greater motivation. They also tend to retain and make use of what they learn better and longer than do the reactive learners."[13] As pointed out earlier, the contexts and needs of our times are such as to require learnings of the self directed type. Independence in learning can be stressed in any teaching-learning situation, but it is more likely to result from situations in which teacher and learner are separated.

A commonly accepted definition of independent study states:

"Independent study consists of various forms of teaching-learning arrangements in which teachers and learners carry out their essential tasks and responsibilities apart from one another, communicating in a variety of ways for the purpose of freeing internal learners from inappropriate class pacings or patterns, of providing external learners with opportunities to continue learning in their own environments, and of developing in all learners the capacity to carry on self-directed learning, the ultimate maturity required of the educated person. Independent study programs offer learners varying degrees of freedom in the self-determination of goals and activities, and in starting, stopping and pacing individualized learning programs which are carried on to the greatest extent possible at the convenience of the learners."[14]

Moore[15] noted that teaching in "independent study is, paradoxically, both responsive and anticipatory." The independent learner is "independent, first, of other direction; he is autonomous. Second, he is independent of the space-time bondage made necessary only by a tradition of dependent or 'other directed' teaching. The greater his autonomy, the more 'distance' he can tolerate, and therefore the more he is independent."

Macdonald[16] pointed out that the freedom sought for and by independent learners represents a hierarchy: First of all, independent learning should be self-pacing; that is, the independent learner should be free to pace his learning according to his circumstances and needs. Second, the learner should be free to follow any of several available channels for

learning, and should not be confined to a single channel. Third, the learner should have freedom in the selection of goals and the activities he chooses to follow. This third freedom is the freedom of the learner to determine his own goals and activities because "morality in the schools" (the issue of whether schools serve the learner or the system) "is all a matter of beginnings. The concept of independent learning seems most provident for realizing a moral school."

Gleason[17] defined independent study as instructional systems which "make it possible for the learner to pursue the study of personally significant areas in an independent manner—freed of bonds of time, space, and prescription usually imposed by conventional instruction." Dubin and Taveggia[18] described two kinds of independent study, one including teacher guidance and direction, and the other carried on in the absence of a teacher.

Dressel and Thompson[19] observed that "Independent study, interpreted as a capacity to be developed, comes close to being if it is not, indeed, the major goal of all education," and defined independent study as "the student's self-directed pursuit of academic competence in as autonomous a manner as he is able to exercise."

The teaching-learning programs that meet to some degree the criteria set by Moore and the definition of independent study go by many names. They are found in schools, but exhibit greatest vigor and variety outside schools and colleges. No matter what they are called, these programs signal an end to space-time barriers to learning; they signal a separation of and concern for teaching and learning; they signal the use of a communication technology to link teacher and learner; and they signal greater autonomy on the part of the learner as a desirable end.

Indeed—taken all together—the programs with such different names comprise not several different educational endeavors, but a great new development in education, in which technology has an essential part.

Cyril Houle[20] suggested that America was entering a third era in higher education. That new era recognizes the societal imperative of access to learning for all people (let's call that openness of education); it recognizes that all learners, on the basis of their needs, should have some degree of direction over the education they obtain for themselves (let's call that the exercise of learner autonomy); it recognizes that different learners have different cognitive styles congruent with their personality and self concepts (let's call that learner differentiation according to field independence-dependence); it recognizes that regardless of where learners live, however remote from instructional resources and whatever their condition, the ancient restrictions to access derived from a space-time-elite perception of learning can be overcome by various media of communications (let's call that coping with physical distance).

The "new learning" rests on generally accepted theories of how learning occurs. Learning is accomplished in three stages—

A. <u>Acquisition</u> of Information

(from whatever communications or experience mode)

(according to coded capacity to receive information)

B. Transmutation of Information

(internalizing; linking up with previous learnings, experience)

(This is where the reciprocal interplay between coded capacity and environmental stimuli combine in perceiving information, categorizing, organizing, interpreting; perceptions of self, values.)

C. Evaluation/Application of Information

(according to coded capacity; values, convictions, perceptions of self and external reality)

Clearly, learning is idiosyncratic, active, can only be done by the learner himself, is different for each learner, and is not complete until the learner has passed learning through all three stages. The learner must do this for himself. In the old classroom model, learning was assumed to fit a space-time frame. A linear, sequential, cause-effect, time-controlled/determined relationship between teaching and learning was accepted. We know now that such a simple view of the teaching and learning relationship is fallacious, but because the classroom model required such a view, and did not provide opportunity for the study of any but captive/submissive learners, there has been little pressure to study learning in any other setting.

Classrooms impose a time constraint on learning which operates to discourage learning through all three stages. Consequently, teachers tend to assess learning only at the first stage—acquisition of information. We will have to extend our concern for learning through all stages of learning, in some ways an easier and more reachable goal in nontraditional than it is in a time-sequenced classroom setting.

If teaching is not an event of social interaction that must be confined to a prescribed social space and communications mode, what is it? Here

we may be able to return to the Platonic model, and consider teacher as critic, mentor, guide, adviser, problem-solver, thinker and facilitator. The advance preparation of learning materials, and the response needs of distant learners require such a change. The classroom model emphasized the first stage of learning, with teacher as information and law-giver; it assumed passive learners and depended largely on extrinsic motivation. The new model will not work unless the teacher is seen as the developer of learners, preserving their integrity-responsibility for self direction. It assumes active learners intrinsically motivated, and an equal emphasis on all three stages of learning.

We must give careful consideration to the environment for learning when the classroom is no longer the place where learning must take place. Instead of thinking of the school or classroom as the environment for learning, we must now see that the learner and his surround are the environment for learning. That is what must be enriched. The teacher's tasks include the enrichment of the learner's environment external to the school. This concept will have important implications for the design of physical facilities for teacher and learners. This perception of environment will have an effect on homes, workplaces, libraries, museums, art galleries and exhibitions of all kinds, as well as schools, opening up the community of living and working as part of the learning environment.

Learner field dependence-independence appears to be significant with respect to learning style, success in problem solving, and personality self concept. If learners may now make choices, options should be designed

not alone to provide freedom from time-space constraints, but also to offer differing modes of instruction which best suit learning needs at the time of selection. Furthermore, since it is known that learners tend to mature towards independence, learners should not be expected to need or select the same modes of instruction for learning throughout their lives.

Knowles[21] contrasted the assumptions that lie behind five important aspects of learning, teacher-directed or self-directed:

ASSUMPTIONS		
About	Teacher-directed learning	Self-directed learning
Concept of learner	Dependent personality	Increasingly self-directed organism
Role of learner's experience	To be built on, more than used	A rich source for learning
Readiness to learn	Varies with levels of maturation	Develops from life tasks and problems
Orientation to learning	Subject-centered	Task or problem-centered
Motivation	External rewards and punishments	Internal incentives, curiosity

While the contrasting assumptions clearly define the outside differences respecting teacher/learner perceptions, they are intended to suggest the range between teacher-directed and learner-directed learning.

The indifferent success of technology applied to unmodified, conventional learning concept and model should be seen as striking evidence that that route doesn't work. The general reluctance of teachers to employ technology is another signal that the standard classroom learning model is perceived by most teachers as complete and satisfactory without technology. Turning these two observations around, this means that the conventional learning concept/model is incongruous respecting learning via technology. On the other hand, the changed societal contexts and needs, the new guidelines for learning, and the integrity of the new learning model which enables us to accommodate physical distance without violating the four essentials of teaching-learning, give us clear signals to proceed is using technology in learning systems.

The problems associated with learning through technology are the product of ancient cultural givens derived from early societal contexts and needs no longer relevant. There are related problems, the presence of which impede the successful use of technology for learning:

1. Media and technology are largely employed as aids in support of <u>conventionally</u> conceived teaching and learning.
2. There is dependence upon <u>conventional</u> subject-matter-centered sources for software development.
3. There is a continuing perception of learning as schooling (i.e., there is a failure to perceive that most learning occurs outside of schools).
4. There is a continuing emphasis on hardware over software in dollars appropriated, in design, development and evaluation; there is an almost excessive concern with the <u>how</u> rather than the <u>what</u> and <u>why</u> of mediated teaching and learning.

5. No solution has been found to the very real psychological problem of educators in the system who feel that they face a devastating loss of self-concept if they embrace technology.
6. The tradition in government, public service, schools and service industries of doing things for people, making them dependent instead of helping people to do things for themselves with increased independence, self reliance and responsibility. The dependency-reinforcing concept of schooling always strengthens the established way of doing things, the status quo, the conventional.
7. Software developers have been fearful of the physical distance that the use of media places between teacher and learner, and have failed to perceive the utility and advantages of exploiting distance in such things as learner motivation, adaptation to individual differences, learner autonomy, the integration of learning and living in the real community, exploring and discovering according to roles of learners rather than institutional roles. Physical distance implies greater freedom, independence, responsibility and choice-making. Agencies accustomed to doing things for people sometimes see these concepts as undermining conventional institutional roles.

From the Viewpoint of the Learner

Learning through technology will, in the end, become a strong force in American education only if it serves learners better than conventional schooling. Since results are largely a matter of beginnings, it is prudent to begin with the learner as central to the use of technology in learning.

To do otherwise relegates technology to the shoring up of conventional teaching and learning practices which are subject and institution centered. No wonder, then, that technology is sometimes accused of being inhumane. Technology can be whatever we want it to be; hence this paper has stressed the humane—learner centered—use of technology.

Communications technology has advanced more rapidly than its utilization in education. The telecommunications satellite offers us now an opportunity for the enlightened utilization of communications in education, another chance for man to address himself again to those great problems of teaching and learning which are not tied to a single place, a single time, a single culture—inadequate opportunity, inadequate learning materials, inadequate instructional systems, inadequate motivational processes, inadequate recognition of the teacher as thinker and creator, and inadequate recognition of the learner as creative participant, motivator and evaluator of learning to meet his needs.

Technology can help shift education from the overemphasis on the inputs of schools, teachers and subject matter to the outputs of learning and the learner. Schools, teachers and subject matter are important, and technology will not replace them, but the accommodation to physical distance and the realization of greater learner autonomy that are the products of technology in learning may make the learner central. That is the viewpoint which should prevail.

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